

### MACHINES FOR WORKING AND POLISHING MARBLE.

For cutting slabs of marble into narrow pieces, such as shelves, and which is effected by hand with grub saws, a machine called a *ripping bed* is employed, in which as many cuts as may be required in the one slab are effected simultaneously, by an equal number of circular saws with smooth edges, revolving vertically, and fed as usual with sand and water. This machine, represented in fig. 3, consists of a bench about 12 or 14 feet long, 6 or 7 wide, and about 2 feet 6 inches high: upon the top

of the bench is fixed two rails, upon which a platform mounted on pulleys is drawn slowly forward by a weight. The horizontal axis carrying the saws revolves about 9 inches above the platform, and to ensure the rotation of the saws, the axis is provided with a projecting rib or feather, extending its whole length. The saws are made as circular plates, about 17 inches diameter when new. The saws, or cutters, are clamped between two collars about 6 inches diameter, fitted so as to slide upon the spindle, and be retained at any part of its length by side screws.

FIG. 3.

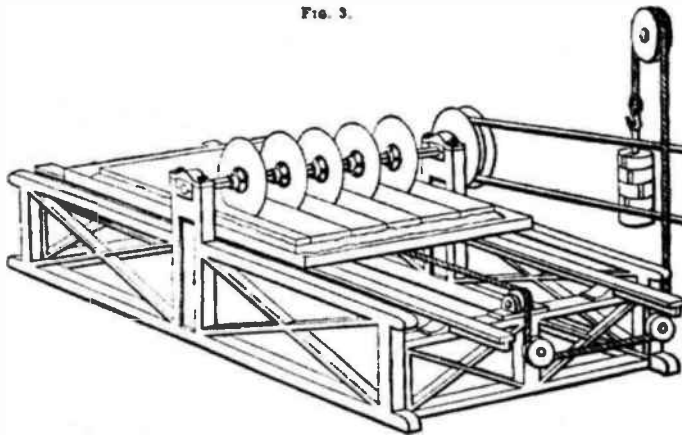


FIG. 4.

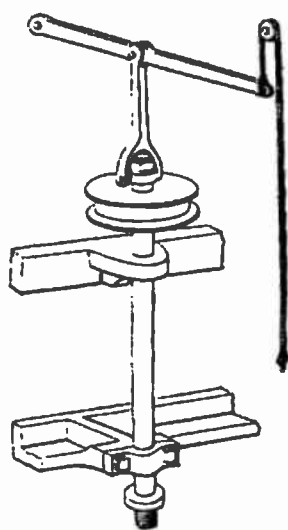


FIG. 5.



FIG. 6.



FIG. 7.

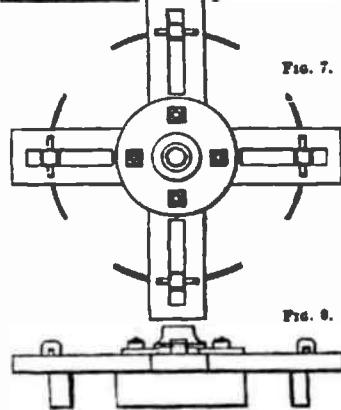


FIG. 8.

The saws having been adjusted to the required distances for the widths of the slabs to be cut, and fixed by the side screws, the slab of marble is embedded in sand upon the platform, and the edge of every saw is surrounded on one side with a small heap of moist sand. The saws are then set in motion so as to cut upwards, and the platform is slowly traversed under the saws by the weight, which keeps the slab of marble constantly pressing against the edges of the revolving saws, until the slab is entirely divided into slabs.

When the saws are new they nearly reach the upper surface of the platform, and a moderate thickness of sand, just sufficient to form a bed for the slab of marble, raises it high enough to allow the saws to pass entirely through the thickness of the slab; but as the saws are reduced in diameter by wear, it becomes necessary to employ a thicker layer of sand, or to use a supplementary platform to raise the slab to the proper height. To avoid this inconvenience, an improvement has been recently introduced by mounting the axis of the saws in a vertical slide, which is adjusted by a rack and pinion, so as to allow the edges

of the saw to penetrate exactly to the required depth.

Circular pieces of marble, such as the tops of round tables, and other objects, from about 6 feet diameter to the small circular dots sometimes used in tessellated pavements, are sawn to the circular form by means of revolving cylindrical cutters, constructed on much the same principle as crown saws for wood. The slab to be sawn is placed horizontally on a bench, and the axis of the machine works vertically above it in cylindrical bearings, which allow the spindle to slide through them, so as to be elevated or depressed according to circumstances. The spindle is suspended at the upper end by a swing collar attached to a connecting rod, that is jointed to the middle of a horizontal lever. The weight of the vertical rod and cutter supplies the pressure for the cutting, and the whole is raised for the admission of the work by a rope attached to the end of the lever, and passed over a pulley as shown in fig. 4.

For circles of small diameter, the cutters are made as hollow cylinders of sheet iron of various diameters, and each attached by screws to a circular disk of cast iron, as shown in section in fig. 6. The cutter is screwed on the lower end of the spindle, just the same as

a chuck on a lathe mandrel, except that the spindle is placed vertical instead of horizontal. To ensure free access for the sand and water beneath the cutter, one or two notches, about three-quarters of an inch wide, are generally made in the lower edge.

For large circles, the apparatus is made stronger than that shown in fig. 4, and the vertical spindle is fitted at its lower extremity with a circular plate, to which is bolted a wooden cross, shown in plan in fig. 7, and in elevation in fig. 8: the cross has radial grooves about 18 inches long near the outer extremities of the four arms. The cutters consist of detached plates of iron from 6 to 18 inches long, of various widths, according to the thickness of the work. The cutters are curved as segments of a cylinder, of the particular diameter they are required to cut, and are each rivetted to a clamp that passes through the radial groove, and is retained by a wedge. The number and length of the cutters is solely a matter of convenience, as a single cutter, when put in rotation, would make a circular groove, and several cutters are only employed in order to expedite the process. But every different diameter requires a different curve in the cutters, and which must all be placed at exactly the proper distance from the centre of rotation.

The horizontal bench upon which the marble is laid, is generally a temporary structure, adjusted to suit the thickness of the object to be sawn. Works of large diameter are seldom more than one or two inches thick, but those of small diameter are frequently much thicker, and sometimes three or four thin pieces are cemented upon each other, and cut at one operation. Short pillars are sometimes sawn out of an irregular block in a similar manner, instead of being chipped and turned. And it has been proposed that long cylinders, and tubes of stone, should be cut with cylinders of sheet iron of corresponding length, put in rotation, and supplied with sand and water.

Marble works of small and medium size, are ground flat upon horizontal revolving laps, after the same general method as that pursued by the lapidary, but with a proportionate increase of size in the lap, which is supplied as usual with sand and water. The laps for marble works are made as circular plates of cast-iron, from 6 to 14 feet diameter, and about 3 inches thick when new: they are mounted in various ways upon vertical spindles, so that their upper sides or faces may be about 2 feet 6 inches above the ground. Across the face of the lap, or as it is called the *sanding plate*, one or two strong square bars of wood, faced with iron, are fixed so that their lower sides may just avoid touching the face of the lap, and their edges present perpendicular faces, from 5 to 6 inches high, at right angles to the face of the lap. The wooden bars serve as stops to prevent the work from being carried round by the lap, and also as guides to ensure the work being ground square.

The piece of marble is laid flat upon the lap, with the face to be ground downwards, and the side of the work in contact with the guide bar. Water is allowed to drip upon the plate from a cistern fixed above, and small quantities of sand are thrown on as required. During the progress of the work the workman leans upon the marble, the position of which is shifted occasionally to expose both the work and the lap to an equal amount of wear, and prevent the formation of ridges, but which is less likely to occur with iron laps used for grinding large surfaces of marble, than when small objects are applied upon lead laps, as by the lapidary and mechanician.

The one side of the marble having been reduced to a flat surface, the work is turned over to grind the adjoining face, and the first face is held in contact with the perpendicular side of the guide bar, in order to prevent the second face of the work to the lap at right angles to the first. When two pieces of similar size are to be ground each on the one face and two edges, as for the upright sides of a chimney-piece, the two pieces of marble are cemented together back to back with plaster of Paris (a process that is called *lining*), and the pair are ground as one piece on all four